CLAIMS

What is claimed is:

1. A method of providing an electroluminescent coating system for a vehicle, said method comprising the steps of:

(A) providing a conductive substrate;

(B) applying a dielectric coating composition, comprising an electroluminescent phosphor, to the conductive substrate thereby forming a dielectric film layer on the conductive substrate; and

(C) applying a conductive coating composition, comprising an electroconductive additive, to the dielectric film layer thereby forming a conductive film layer on the dielectric film layer,

wherein the electroluminescent phosphor is excitable by an electrical field established across the dielectric film layer such that the coating system of the vehicle is electroluminescent upon application of an electrical charge to the conductive substrate and the conductive film layer.

2. A method as set forth in claim 1 wherein step (B) comprises applying an electroluminescent coating composition, comprising the electroluminescent phosphor, between the conductive substrate and the conductive film layer thereby forming an electroluminescent film layer.

3. A method as set forth in claim 1 wherein step (B) comprises applying an insulating coating composition, comprising the electroluminescent phosphor and a

dielectric additive, between the conductive substrate and the conductive film layer thereby forming an insulating film layer.

4. A method as set forth in claim 2 wherein step (B) further comprises applying an insulating coating composition, comprising a dielectric additive, between the conductive substrate and the conductive film layer thereby forming an insulating film layer.

5. A method as set forth in claim 4 wherein;

the step of applying the electroluminescent coating composition is further defined as applying the electroluminescent coating composition to the conductive substrate to form the electroluminescent film layer, and

the step of applying the insulating coating composition is further defined as applying the insulating coating composition to the electroluminescent film layer to form the insulating film layer adjacent the conductive film layer.

6. A method as set forth in claim 4 wherein the step of applying the insulating coating composition comprising the dielectric additive is further defined as applying an insulating coating composition comprising a titanate, an oxide, a niobate, an aluminate, a tantalate, a zirconate, or combinations thereof, as the dielectric additive.

7. A method as set forth in claim 4 wherein the step of applying the insulating coating composition comprising the dielectric additive is further defined as applying an insulating coating composition further comprising a pigment selected from the group consisting of organic pigments, inorganic pigments, and combinations thereof.

8. A method as set forth in claim 4 wherein the step of applying the insulating coating composition comprising the dielectric additive is further defined as applying an insulating coating composition comprising from 10 to 20 parts by weight of the dielectric additive based on 100 parts by weight of the insulating coating composition.

9. A method as set forth in claim 4 wherein step (C) is further defined as applying a conductive coating composition comprising antimony-doped tin oxide as the electroconductive additive.

10. A method as set forth in claim 4 wherein step (C) is further defined as applying a conductive coating composition to form a conductive film layer having an electrical conductivity of at least 90 mhos.

11. A method as set forth in claim 4 wherein step (C) is further defined as applying a conductive coating composition comprising from 25 to 75 parts by weight of the electroconductive additive based on 100 parts by weight of the conductive coating composition.

12. A method as set forth in claim 4 wherein the step of applying the electroluminescent coating composition comprising the electroluminescent phosphor is further defined as applying an electroluminescent coating composition comprising copper-doped zinc sulfide as the electroluminescent phosphor.

13. A method as set forth in claim 4 wherein the step of applying the electroluminescent coating composition comprising the electroluminescent phosphor is

further defined as applying an electroluminescent coating composition further comprising a pigment selected from the group consisting of organic pigments, inorganic pigments, and combinations thereof.

14. A method as set forth in claim 4 wherein the step of applying the electroluminescent coating composition comprising the electroluminescent phosphor is further defined as applying an electroluminescent coating composition comprising from 5 to 25 parts by weight of the electroluminescent phosphor based on 100 parts by weight of the electroluminescent coating composition.

15. A method as set forth in claim 1 wherein;

step (B) is further defined as applying a thermoset dielectric coating composition, comprising a functional resin and a cross-linking agent reactive with the functional resin, to the conductive substrate thereby forming an uncured dielectric film layer on the conductive substrate, and

step (C) is further defined as applying a thermoset conductive coating composition, comprising a functional resin and a cross-linking agent reactive with the functional resin, to the uncured dielectric film layer thereby forming an uncured conductive film layer on the uncured dielectric film layer.

16. A method as set forth in claim 15 further comprising the step of simultaneously curing the uncured dielectric film layer and the uncured conductive film layer such that the uncured film layers cross-link to provide the coating system.

17. A method as set forth in claim 1 further comprising the step of applying a clearcoat coating composition to the conductive film layer thereby forming a clearcoat film layer on the conductive film layer.

18. A method as set forth in claim 1 wherein step (A) is further defined as providing a conductive substrate selected from the group consisting of aluminum, steel, and combinations thereof.

19. A method as set forth in claim 1 wherein step (A) is further defined as providing an automotive body panel as the conductive substrate.

20. A method as set forth in claim 1 further comprising the step of providing a non-conductive substrate.

21. A method as set forth in claim 20 wherein step (A) is further defined as applying a conductive primer coating composition to the non-conductive substrate thereby forming a conductive primer film layer as the conductive substrate on the non-conductive substrate.

22. A method as set forth in claim 1 further comprising the step of applying an electrical charge to the conductive substrate and the conductive film layer to establish an electrical field across the dielectric film layer such that the coating system is electroluminescent.

23. A method as set forth in claim 22 wherein the step of applying the electrical charge further comprises the step of activating a switch from an interior of the vehicle to apply the electrical charge.

24. A method as set forth in claim 1 wherein step (B) is further defined as applying the dielectric coating composition to a film build suitable for hiding the conductive substrate.

25. A method as set forth in claim 1 wherein;

step (B) is further defined as spray applying the dielectric coating composition, and

step (C) is further defined as spray applying the conductive coating composition.

26. An electroluminescent coating system for a vehicle, said coating system comprising:

a conductive substrate;

a conductive film layer spaced from said conductive substrate, said conductive film layer being formed from a conductive coating composition comprising an electroconductive additive; and

a dielectric film layer disposed between said conductive substrate and said conductive film layer, said dielectric film layer being formed from a dielectric coating composition comprising an electroluminescent phosphor that is excitable by an electrical field established across said dielectric film layer such that said coating system of the vehicle is electroluminescent upon application of an electrical charge to said conductive substrate and said conductive film layer.

27. A coating system as set forth in claim 26 wherein said dielectric film layer comprises an electroluminescent film layer formed from an electroluminescent coating composition applied between said conductive substrate and said conductive film layer, said electroluminescent coating composition comprising said electroluminescent phosphor.

28. A coating system as set forth in claim 26 wherein said dielectric film layer comprises an insulating film layer formed from an insulating coating composition applied between said conductive substrate and said conductive film layer, said insulating

coating composition comprising said electroluminescent phosphor and a dielectric additive.

29. A coating system as set forth in claim 27 wherein said dielectric film layer further comprises an insulating film layer formed from an insulating coating composition applied between said conductive substrate and said conductive film layer, said insulating coating composition comprising a dielectric additive.

30. A coating system as set forth in claim 29 wherein said electroluminescent coating composition is applied to said conductive substrate to form said electroluminescent film layer, and said insulating coating composition is applied to said electroluminescent film layer to form said insulating film layer adjacent said conductive film layer.

31. A coating system as set forth in claim 29 wherein said dielectric additive of said insulating coating composition comprises a titanate, an oxide, a niobate, an aluminate, a tantalate, a zirconate, or combinations thereof.

32. A coating system as set forth in claim 29 wherein said dielectric additive of said insulating coating composition is selected from the group consisting of barium titanate, strontium titanate, bismuth titanate, tantalum titanate, barium strontium titanate, barium zirconium titanate, barium lanthanum titanate, strontium bismuth titanate, lead zirconium titanate, lead lanthanum titanate, titanium dioxide, tantalum pentoxide, barium titanium niobate, barium strontium niobate, lead zinc niobate, lanthanum aluminate, yttrium aluminate, strontium aluminum tantalate, strontium bismuth tantalate, and

combinations thereof.

33. A coating system as set forth in claim 29 wherein said dielectric additive of said insulating composition has a dielectric constant of at least 80 at 20°C and 1kHz.

34. A coating system as set forth in claim 29 wherein said dielectric additive of said insulating composition comprises a ferroelectric ceramic powder having an average particle size of from 0.1 to 5.0 microns.

35. A coating system as set forth in claim 29 wherein said insulating coating composition further comprises a pigment selected from the group consisting of organic pigments, inorganic pigments, and combinations thereof.

36. A coating system as set forth in claim 29 wherein said insulating coating composition comprises from 10 to 20 parts by weight of said dielectric additive based on 100 parts by weight of said insulating coating composition.

37. A coating system as set forth in claim 29 wherein said electroconductive additive of said conductive coating composition comprises antimony-doped tin oxide.

38. A coating system as set forth in claim 29 wherein said electroconductive additive of said conductive coating composition is selected from the group consisting of carbon black particles, gold particles, silver particles, iron particles, copper particles, brass particles, bronze particles, gold-coated particles, silver-coated particles, and combinations thereof.

39. A coating system as set forth in claim 29 wherein said electroconductive additive of said conductive coating composition comprises an electrically-inert core and

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an electroconductive shell at least partially surrounding said electrically-inert core.

40. A coating system as set forth in claim 39 wherein said electrically-inert core is selected from the group consisting of silica cores, mica cores, titanium cores, and combinations thereof.

41. A coating system as set forth in claim 40 wherein said electroconductive shell is an antimony-doped tin oxide shell.

42. A coating system as set forth in claim 29 wherein said conductive film layer has an electrical conductivity of at least 90 mhos.

43. A coating system as set forth in claim 29 wherein said electroconductive additive of said conductive coating composition comprises an electroconductive powder having an average particle size of from 0.1 to 5.0 microns.

44. A coating system as set forth in claim 29 wherein said conductive coating composition comprises from 25 to 75 parts by weight of said electroconductive additive based on 100 parts by weight of said conductive coating composition.

45. A coating system as set forth in claim 29 wherein said electroluminescent phosphor of said electroluminescent coating composition comprises copper-doped zinc sulfide.

46. A coating system as set forth in claim 29 wherein said electroluminescent phosphor of said electroluminescent coating composition comprises a zinc-sulfide based phosphor activated with a rare earth element, a strontium-aluminate based phosphor activated with a rare earth element, or combinations thereof.

47. A coating system as set forth in claim 29 wherein said electroluminescent phosphor of said electroluminescent coating composition is of the general formula SrS:Eu:X, where X is selected from the group consisting of chlorine, bromine, rare earth elements, and combinations thereof.

48. A coating system as set forth in claim 29 wherein said electroluminescent coating composition further comprises a pigment selected from the group consisting of organic pigments, inorganic pigments, and combinations thereof.

49. A coating system as set forth in claim 48 wherein said pigment is TiO_2.

50. A coating system as set forth in claim 29 wherein said electroluminescent coating composition comprises from 5 to 25 parts by weight of said electroluminescent phosphor based on 100 parts by weight of said electroluminescent coating composition.

51. A coating system as set forth in claim 29 wherein each of said conductive coating composition, said electroluminescent coating composition, and said insulating composition are thermoset coating compositions comprising a functional resin and a cross-linking agent reactive with said functional resin.

52. A coating system as set forth in claim 51 wherein said functional resins are selected from the group consisting of acrylics, polyurethanes, polyesters, and combinations thereof.

53. A coating system as set forth in claim 52 wherein said cross-linking agents are selected from the group consisting of aminoplast resins, isocyanate cross-linking agents, and combinations thereof.

54. A coating system as set forth in claim 26 further comprising a clearcoat film layer disposed on said conductive film layer, said clearcoat film layer being formed from a clearcoat coating composition.

55. A coating system as set forth in claim 54 wherein said clearcoat coating composition is tinted with a pigment selected from the group consisting of organic pigments, inorganic pigments, and combinations thereof.

56. A coating system as set forth in claim 26 wherein said conductive substrate is selected from the group consisting of aluminum, steel, and combinations thereof.

57. A coating system as set forth in claim 26 wherein said conductive substrate is an automotive body panel.

58. A coating system as set forth in claim 26 further comprising a non-conductive substrate.

59. A coating system as set forth in claim 58 wherein said non-conductive substrate is plastic.

60. A coating system as set forth in claim 58 wherein said conductive substrate is a conductive primer film layer disposed on said non-conductive substrate, said conductive primer film layer being formed from a conductive primer coating composition applied to said non-conductive substrate.

61. A coating system as set forth in claim 26 further comprising a first electrical lead connected to said conductive substrate for applying said electrical charge

to said conductive substrate and a second electrical lead connected to said conductive film layer for applying said electrical charge to said conductive film layer such that said coating system of the vehicle is electroluminescent.